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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/743,418	12/22/2003	John South Lewis III	MCNC-SRT-548.01	7518

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MILLER PATENT SERVICES
2500 DOCKERY LANE
RALEIGH, NC 27606

EXAMINER

THOMAS, BRANDI N

ART UNIT	PAPER NUMBER
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2873

DATE MAILED: 10/27/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/743,418

Applicant(s)

LEWIS ET AL.

Examiner

Brandi N Thomas

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-65 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-24 and 50-57 is/are allowed.
- 6) ☒ Claim(s) 25,30-32,36-40,43-49 and 58-65 is/are rejected.
- 7) ☒ Claim(s) 26-29,33-35,41 and 42 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>12/22/03</u> | 6) <input checked="" type="checkbox"/> Other: <u>Detailed Action</u> |

DETAILED ACTION

Information Disclosure Statement

1. Acknowledgement is made of receipt of Information Disclosure Statement(s) (PTO-1449) filed 12/22/03. An initialed copy is attached to this Office Action.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 25, 30-32, 36-40, 43-47, 58-60, and 62-64 are rejected under 35 U.S.C. 102(e) as being anticipated by Papadimitrakopoulos et al. (US 2004/0118339 A1).

Regarding claim 25, Papadimitrakopoulos et al. discloses, in figures 4 and 5A, a photonic crystal structure, comprising: a substrate (labeled) processed to bond preferentially to a first material in selected areas (section 0048), a first layer of first microspheres (32), the first layer being one microsphere deep, the first microspheres (32) comprising the first material (SiO₂) and bonded to the selected areas of the substrate (labeled); and a second layer of second microspheres (31) one microsphere deep and bonded to the first layer of microspheres (sections 0047 and 0048).

Regarding claim 30, Papadimitrakopoulos et al. discloses, in figures 4 and 5A, a photonic crystal structure, wherein first microspheres (32) have a first molecule on a surface thereof, and wherein the second microspheres (31) have a second molecule on a surface thereof, wherein the first and second microspheres (31 and 32) bond to each other but not to themselves (sections 0047 and 0048).

Regarding claim 31, Papadimitrakopoulos et al. discloses, in figures 4 and 5A, a photonic crystal structure, wherein first microspheres (32) have a first bulk or surface electrostatic charge, and wherein the second microspheres (31) have a second bulk or surface electrostatic charge which is opposite and attractive to the first electrostatic charge, wherein the first and second microspheres (31 and 32) bond to each other but not to themselves (sections 0021, 0024, 0047, and 0048).

Regarding claim 32, Papadimitrakopoulos et al. discloses, in figures 4 and 5A, a photonic crystal structure, wherein the bond comprises at least one of covalent bonding, electrostatic attraction, metallic bonding, hydrogen bonding, Van der Waals forces, hydrophobic/hydrophilic attractions and biological recognition (sections 0006 and 0021).

Regarding claim 36, Papadimitrakopoulos et al. discloses, in figures 4 and 5A, a photonic crystal structure, wherein the first and second microspheres (31 and 32) are coated with first and second polyelectrolyte layers, wherein the first and second polyelectrolyte layers have opposite charge (sections 0024 and 0047).

Regarding claim 37, Papadimitrakopoulos et al. discloses, in figures 4 and 5A, a method of fabricating a photonic crystal, comprising: providing a substrate (labeled), bonding a single layer of microspheres (32) one microsphere deep to the substrate (labeled) to form a first layer,

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and bonding a single layer of microspheres (31) one microsphere deep to the first layer to form a second layer (sections 0047 and 0048).

Regarding claim 38, Papadimitrakopoulos et al. discloses, in figures 4 and 5A, a method of fabricating a photonic crystal, further comprising repeatedly bonding a layer of microspheres (31) one microsphere deep to a most recently formed layer (32) to produce a multiple layer photonic crystal (sections 0047 and 0048).

Regarding claim 39, Papadimitrakopoulos et al. discloses, in figures 4 and 5A, a method of fabricating a photonic crystal, wherein the bond comprises at least one of covalent bonding, electrostatic attraction, metallic bonding, hydrogen bonding, Van der Waals forces, hydrophobic/hydrophilic attractions and biological recognition (sections 0006 and 0021).

Regarding claim 40, Papadimitrakopoulos et al. discloses, in figures 4 and 5A, a method of fabricating a photonic crystal, further comprising modifying the most recently formed layer (32) to cause the layer to bond with a next layer of microspheres (32) (sections 0047 and 0048).

Regarding claim 43, Papadimitrakopoulos et al. discloses, in figures 4 and 5A, a method of fabricating a photonic crystal, wherein the first and second microspheres (31 and 32) are coated with first and second polyelectrolyte layers, wherein the first and second polyelectrolyte layers have opposite charge (sections 0024 and 0047).

Regarding claim 44, Papadimitrakopoulos et al. discloses, in figures 4 and 5A, a method of fabricating a photonic crystal, comprising: providing a templated substrate (labeled) having a first charge, and exposing the templated substrate (labeled) to a plurality of first microspheres (32) having a polyelectrolyte coating carrying a second charge, the second charge being opposite the first charge so that the plurality of first microspheres (32) will bond to the templated substrate

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(labeled) and form a self-passivated layer of first microspheres to produce a first layer (sections 0024, 0047, and 0048).

Regarding claim 45, Papadimitrakopoulos et al. discloses, in figures 4 and 5A, a method of fabricating a photonic crystal, exposing the first layer to a plurality of second microspheres (32) having a polyelectrolyte coating carrying the second charge in order to bond to the first layer and form a self-passivated second layer of second microspheres (32) (sections 0024 and 0047).

Regarding claim 46, Papadimitrakopoulos et al. discloses, in figures 4 and 5A, a method of fabricating a photonic crystal, exposing the second layer to a plurality of first microspheres (31) having a polyelectrolyte coating carrying the first charge in order to bond to the second layer and form a self-passivated first layer of first microspheres (31) (sections 0024 and 0047).

Regarding claim 47, Papadimitrakopoulos et al. discloses, in figures 4 and 5A, a method of fabricating a photonic crystal, further comprising: repeatedly exposing a most recently formed layer to microspheres to a plurality of microspheres coated with a charged polyelectrolyte coating that will bond to the most recently formed layer and self-passivate to fabricate a multiple layer photonic crystal (sections 0024 and 0047).

Regarding claims 58 and 62, Papadimitrakopoulos et al. discloses, in figures 4 and 5A, a method of fabricating a photonic crystal, comprising: providing a templated substrate (labeled), bonding a single layer of charged coated microspheres (32) one microsphere deep to the templated substrate (labeled) to form a first layer, and bonding a single layer of charged polymer coated microspheres (31) one microsphere deep to the first layer to form a second layer (sections 0047 and 0048).

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Regarding claims 59 and 63, Papadimitrakopoulos et al. discloses, in figures 4 and 5A, a method of fabricating a photonic crystal, further comprising repeatedly bonding a layer of charged polymer coated microspheres one microsphere deep to a most recently formed layer to produce a multiple layer photonic crystal (sections 0047 and 0048).

Regarding claims 60 and 64, Papadimitrakopoulos et al. discloses, in figures 4 and 5A, a method of fabricating a photonic crystal, wherein the charged polymer comprises a polyelectrolyte (section 0047).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 48, 49, 61, and 65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Papadimitrakopoulos et al. (US 2004/0118339 A1).

Regarding claims 48, 49, 61, and 65, Papadimitrakopoulos et al. discloses the claimed invention except for the last layer comprises carboxylated microspheres and the first and second microspheres being coated with one of Poly(sodium 4 styrenesulfonate) and Poly(diallyldimethylammonium chloride). It would have been obvious to modify the microspheres in the photonic crystal to comprise carboxylated microspheres and first and second microspheres being coated with one of Poly(sodium 4 styrenesulfonate) and Poly(diallyldimethylammonium chloride), since it has been held to be within the general skill of

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a worker in the art to select a known material on the basis of its suitability for the intended use (In re Leshin, 125 USPQ 416). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the microspheres in the photonic crystal to comprise carboxylated microspheres and first and second microspheres being coated with one of Poly(sodium 4 styrenesulfonate) and Poly(diallyldimethylammonium chloride) for the purpose of analyzing protein interactions.

Allowable Subject Matter

6. Claims 1-24 and 50-57 are allowed.
7. Claims 26-29, 33-35, 41 and 42 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
8. The prior art taken either singularly or in combination fails to anticipate or fairly suggest the limitations of the independent claim(s), in such a manner that a rejection under 35 U.S.C. 102 or 103 would be proper. The prior art fails to teach a combination of all the claimed features as presented in claim(s) 1-24, 41, and 42, wherein the claimed invention comprises a photonic crystal structure and a method of fabricating a photonic crystal, comprising: a method of fabricating a photonic crystal, comprising: a plurality of first microspheres made of a first material, the first material being of a type that will bond to the substrate and form a self-passivated layer of first microspheres to produce a first layer; and exposing the first layer to a plurality of second microspheres made of a second material, the second material being of a type that will bond to the first layer and form a self-passivated second layer of second microspheres;

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wherein one of the first and second microspheres have RNA strands on a surface thereof, and wherein the other of the first and second microspheres have at least one of complimentary DNA strand, complimentary RNA strands, oligonucleotides and RNA binding proteins on a surface thereof, as claimed.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Norris et al. (US 2002/0062782 A1) discloses self-assembled photonic crystals, including large sphere planar opals, infiltrated planar opals, and inverted planar opals.

Summers et al. (US 2004/0170352 A1) discloses a photonic crystal including a phosphor matrix and a plurality of defect regions.

Margel (5652059) discloses a composition of matter which comprises a solid substrate having covalent bonds to at least one member selected from sub-groups (a) and (b), namely: (a) substantially a single layer of at least one species of microspheres containing residual reactive functions.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brandi N Thomas whose telephone number is 571-272-2341.

The examiner can normally be reached on 8-5.

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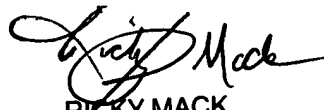
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Epps can be reached on 571-272-2328. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

BNT

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October 25, 2004


RICKY MACK
PRIMARY EXAMINER